NASA Earth Science and Applications from Space Strategic Roadmap Committee

Wrap-up Summary Notes from January 27, 2005

(Corrections, Cover Page added 2/2/2005)

Changes Since Bretherton

- Advances in Biology
- Human Impacts
- Advances in Technology

Subcommittee Assignments

- Define Objectives
- Missions or Activities Pathways/Options
- Tangible Missions, Something New, What is Frontier?
- Figures of Merit

Subcommittee Assignments

- Explorations
  - Waleed Abdalati*
  - David Siegel
  - Sean Solomon
  - Leo Andreoli
  - Bill Gail

(Full names added 2/2/2005 -- asterisk indicates subcommittee lead)

Subcommittee Assignments

- Continuous Awareness
  - Doug Rotman*
  - Walt Brooks
  - Chris Kummerow
  - David Skole
  - Jack Dangermond

(Full names added 2/2/2005 -- asterisk indicates subcommittee lead)

Subcommittee Assignments

- Maintaining Perspectives
  - Colleen Hartman*
  - Victor Zlotnicki
  - Joyce Penner
  - Eric Sanderson

(Full names added 2/2/2005 -- asterisk indicates subcommittee lead)

Explorations

- Explore the Frontiers of Science
  - Responsive system of ground- and ocean-based sensors, NASA missions can directly interact
  - Signposts to the Frontier
  - What Defines the Frontier
    - Places we've never seen
    - Processes we don't understand
    - Phenomena we can't yet sample
    - Perspectives we have not yet used
  - Connection Between Earth Exploration and Exploration of the Solar System

Explorations

- Explore the Frontiers of Science
  - Solid Earth
  - Integration of biological processes
  - Human impact on climate
  - Quantitative estimate of change in human impacts

Explorations

- Explore the Frontiers of Science
  - Biology
  - Bottom of the Ice, Bottom of the Ocean
  - Analog Environments
  - Integrating Space Observations
    - E.g., tundra, gas fluxes
- Feedback of Human Activities
- “What Ifs?” Earth as Laboratory for Planetary Exploration
- Follow the water, follow the energy,

Explorations

- Missions (program, campaign):
  - Environmental Change Forecast Uncertainty Mission
  - Human Impact on the Earth Mission
- Take NSF Document, assess NASA's role

Continuous Awareness

- Cost of models vs. cost of missions
  - Replace diagnostic models with direct measurements; shift to prognostic modeling?
  - Relationship between space observations and models
- Distribution of life on Earth and how it is changing
- New Science Enabled by Cont. Awareness
  - What Objective, what components?
  - How do for less?
- 4-D Models and Data Assimilation

Continuous Awareness

- What critical problems would such systems address?
  - Carbon cycle disturbances
  - Land cover changes, Agriculture and food
  - Ecosystem services; understanding the value (economic) of services performed by ecosystems
  - Water - follow the water (dynamic cycling)
  - Hazards
  - Air Pollution
  - Aid the decision-making process - protection of proprietary data sources?
- Active Tasking of Observing Assets and Models

Maintain Perspective

- Distinguished from Continuous Awareness by Long Time Scales
- Sustaining of Long-term Data Sets and Observations
  - First Collection 50 year Data Sets is Frontier Science
  - What phenomena require long-term data records to satisfy NASA science goals?
  - Example of Environmental Data Records (not method dependent)

Maintain Perspective

- Transition from Research to Operations
  - MOU with Operational Agency from the start?
  - Is 5 years of research operations enough to develop operational agency user base?
  - Assumptions about who should do what, role of NASA, NOAA, potentially other Agencies, Commercial Entities
  - What about important data sets with no target operational/commercial entity?

Maintain Perspective

- Data Stewardship
- Long Term Measurements (100 year)
  - NASA can take on the technological challenges of how to obtain and maintain 100 year data sets (and modeling results?)
  - Consistency in measurement vs. upgrading of instrument technology and capacity
  - Inter-instrument calibration vs. very long life observatories
  - Implications and trade-offs for calibration and validation and data management
  - Does the operational agency need that level of calibration (what if it is not a goal of the operational agency)?
  - Request for Staff assessment of how to run a 100 year program

Maintain Perspective

- Analysis of Prediction Capability
  - Long-term, high quality modeling, not necessarily near-real-time
  - Forecasts and Hindcasts (paleoclimate)
  - Reanalysis, access to past model results, and inter-model comparisons
- What are specific ways NASA can strengthen this goal
  - Technologies
  - Architectures
  - Others?
- Identify a few exciting things